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Design Of A Housing For Urban Artisan-Living Work

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DESIGN OF A HOUSING FOR URBAN ARTISAN-LIVING WORK

A Thesis Presented

By

FAHIM MAHMUD

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
Of the requirements for the degree of

MASTER OF ARCHITECTURE

May 2015

Department of Architecture
University of Massachusetts, Amherst

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DESIGN OF A CO-HOUSING FOR URBAN CRAFTSMAN

A Thesis Presented

by

FAHIM MAHMUD

Approved as to style and content by:

Kathleen Lugosch, Chair

Joseph Krupczynski, Member

Professor Stephen Schreiber
Chair, Department of Architecture

DEDICATION

To my Life Partner
Nabila Iqbal

ACKNOWLEDGMENTS

My cordial thanks to my thesis committee members who have helped me through the whole design process. Prof. Kathleen Lugosch and Joseph Krupczynski was the main inspiration to my work. They have always encouraged me to go outside of the box. They are the best things happened in my life. When I found out that on my site, the Bangladeshi government have proposed a high-rise building for the same purpose, I became so depressed and disappointed that I wanted to quit the project. At that moment, they were beside me. They brought out the possibilities of this project for the future to me. After they have differentiated the whole system of architecture, I found that the process of design is important here, not just the building. That will be my lifetime lesson in any field I work for.

I am very much happy to have variety of teacher's panel and inside Juror. They objectified lots of possibilities and the pitfalls of my working process. They have also argued with me about lots of ideas that conflicted with my design strategies. That have led me to newer scopes which were fine-tuned by my teachers and cohort.

Again, it would not be possible for me to take this thesis to such level without the help and guidance of my thesis committee members.

ABSTRACT

DESIGN OF CO-HOUSING FOR LOW INCOME INDUSTRIAL WORKERS

MAY 2015

FAHIM MAHMUD, B.ARCH., BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

M.ARCH, UNIVERSITY OF MASSACHUSETTS, AMHERST

Directed by: Professor Kathleen Lugosch
Professor Joseph Krupczynski

Bangladesh is the most densely populated country with 1188 people per square kilometers. It has a total population of 160 million people and among which more than 16 million people lives in the capital, and that makes it one of the most densely populated cities in the world. Consequently there are huge needs for high rise housing to accommodate all those people or otherwise shift them to other place. But our country, at present, does not have enough resource to build up a newer city so that they can solve accommodation, infrastructure and unemployment problems. Thus, the only option is privatization of the housing which also has started in our country and this scenario is appearing to be more devastating. These buildings does not respect nor reflect our culture, history, society, religion, norms, behavior or community. Additionally, these housing units at final level of finishing are out of reach for the low and middle income people even though it was intended to be built for the low income group.

Urban poor is a problem and an also an opportunity for this City. They are actively taking part in the economy and they are the server of the 4th class services of the society. But they don't have proper place to live and facilities to lead their life style. Thus they sometimes choose different path of life leaving behind community values. However, they have lots of potential in

the city and can easily make them useful to contribute to the culture and the society of the city. With a better place to live that will support their life style, they can easily become the keeper of their culture and crafts. With proper housing they can produce income and support their families. We can easily rely on their craftsmanship to retain our culture.

Architecture should be sustainable and for all. So I have decided to work on the housing for mid and low income group so that they can stay and serve the city. It's not only the design strategy but also the complete systematic process so that it can ensure that the end user can afford it. Our country is rich in culture, festivals, history and religion. So the design process should be sophisticated and ingenious to keep it in place. Also in our country still it's a common scenario that most of the house wives doesn't add to any income for the family. From my perspective a sustainable design can make that happen too. Thereafter my thesis intends to develop an architectural solution that can revive this city of Dhaka through ideas sustainable for the city and dweller as well as systemize the infrastructure to manipulate their passive income strategy and ensure a healthy communal and social life for them.

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CHAPTER 1

THESIS INTENT

Introduction

To design a sustainable living places for low income groups, lots of case studies are needed. I have found lots of case studies related to my topic. There's some challenges that the architect addressed for that particular project and I will discuss the strategy taken by the architect to overcome the challenge. That will help me developing my idea and thinking process of discovering the challenge and strategies to the solution. I think this is the best I can get from a precedent study.

For the choice of the case studies, I had to be very conscious because, they should reflect the context of my thesis site. On the other hand, the processes of designing undertaken by the architect should be relevant to my method. I have chosen the projects which are different from each other because I will get different dimensions of ideas from them.

Scope of Thesis

I want to explore the fields necessary for the low cost housing. That's why I have to do research on available materials, labor and site scopes. I will also look through the products that the dwellers going to produce. That will give me proper idea of space needed or program to be put Properly.

Thesis objective

My objective is to provide a guideline for the cities how the housing should be designed. Key factors will vary from place to place. My target is to point out the key notes for housing design so that all the buildings around the world would not follow a particular rule of thumb that has resulted in a dumb box for dwelling.

Housing should be furnished with so many factors and that will also vary from place to place. It should be dynamic and interacting to the dweller. It will behold the culture and social infrastructure. As per my case study, I will develop a proper manner or guideline for designing a sustainable housing.

A residential block should be reflected by the dwelling unit. A housing apartment will focus on the Community activity as well as the whole system of living. Each and every entity of a housing is related with other factors. None can be let alone. A good designer follows all the context to make his housing sustainable. My goal will be to prepare a strategic report for an architect to design quality, affordable, sustainable housing.

Context

single storey	site and surrounding	utility and service	utility and service
Multi storey			
social infrastructure	income level active incoming member man/ woman	religion	culture
user group	outdoor activity indoor activity	interaction	cultural diversity economical diversity
community area	outdoor (multi level) accessible green area income source	participation	cultural diversity economical diversity

Table 1- SWOT analysis

Methodology

First of all I want to study on the craft items that carries the culture, norm and history. Then I will try to identify some of the reasons that caused the sudden death of this activity. Then I will go through a series of case studies to figure out how this situation has been tackled. After that I will choose a site which is encountering similar problems. Then I will start my design through the root level analysis. After that I will go through a ton of analysis to figure out my design strategy. Then I will prepare a master plan of working module. After that, the design decisions will be taken. I should go through a several trial and error check and discuss them with my teacher's panel to figure out my goal for this project. Then I will complete the design process.

CHAPTER 2

LITERATURE REVIEW

Background Study

Aranya Community Housing by Balkrishna V. Doshi

The primary target was to make a low cost housing instead of the ongoing slum increasing problem. Additionally, the architect has improvised lots of great ideas into this project such as social infrastructures, self-developing community facilities. Neighborhood communities, individual plantation areas, terraces that reflects the culture and religion and conveying the message of retaining the culture. The Architect has developed an excellent case study and a background survey while he was designing the housing. He identified the fundamental problems of the slums and densely living problems. Firstly he has tried to develop a prototype housing but later he identified that these strategy should be developed



Figure 1-Aranya community housing master plan, street view and activities

individually by following the challenges and context of the site (www.archdaily.com n.d.) (wwwFOUNDATIONSACKC.com/projects n.d.). As well as, the culture and the profession changes from place to place. Thus he developed an independent design strategy. On the other hand, the architect has also developed general ideas for the prototype low cost housing so that it could

help the other design problems. To that end, the local materials are treated as the basic materials for building foundation and construction. The architect also used the same material so that the cost does not go up. He made some pattern of brick that have

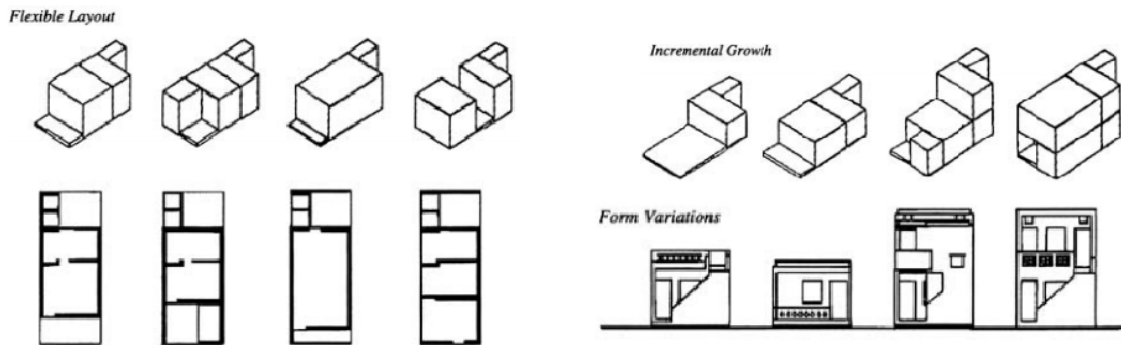


Figure 2- Free layout plan of Arannya Housing

been locally produced. On the other hand, he has made different layout considering the user group number. He made the construction techniques vernacular so that the residents can be used as a laborer. He also intervened a greater idea of developing the master plan. He firstly made a rubber stamp unit block cluster and then designed the open spaces as needed. At a stage he developed the blocks with rectified orientation, minimum heat gain and increased natural shading. At last he finalized the whole master plan with interlinked open spaces, forming varied and distributed amenities. He also ensured a climatic friendly orientation and road networking with optimum output.

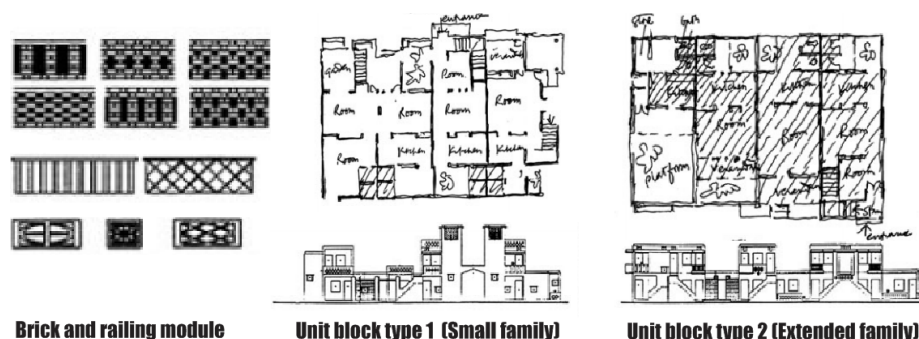


Figure 3-Modul design and the elevation treatment of Arannya housing

Things needed for individual blocks were not ignored, from “putting cloths outside for drying” to “vegetation” that may serve the meal along with a green space for children” was the level of detailing that the architect designed in each block. A clean, culturally sound, self-developing, healthy environment for children, working facilities for women and sustainable housing was the challenge for the architect and he took care of all of them with a very sophisticated hand.

Unite De Habitation by Le Corbusier



Figure 4 Unite de habitat by Le Corbusier

After World War 2 there was a prime and quick need of rehabilitating the people who were affected and lost their homes. The Architect Le Corbusier and Nadir Afonso decided to make a prototype building for providing shelter for them. The first decision was to make the building with brick but for the sake of faster construction, they used concrete and high tensile steel members. it is a good example of brutalism. (www.archdaily.com n.d.) (www-foundationsackc.com/projects n.d.)

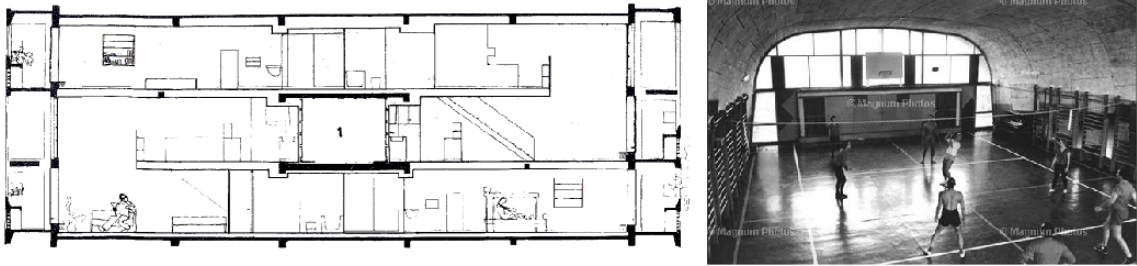


Figure 5-Internal section Showing the functional flow

The main idea was to make an avant guard community housing with facilities such as communal terrace, medical facility, shops, sporting, education facilities, hotel etc. so that the building becomes source of income for itself.

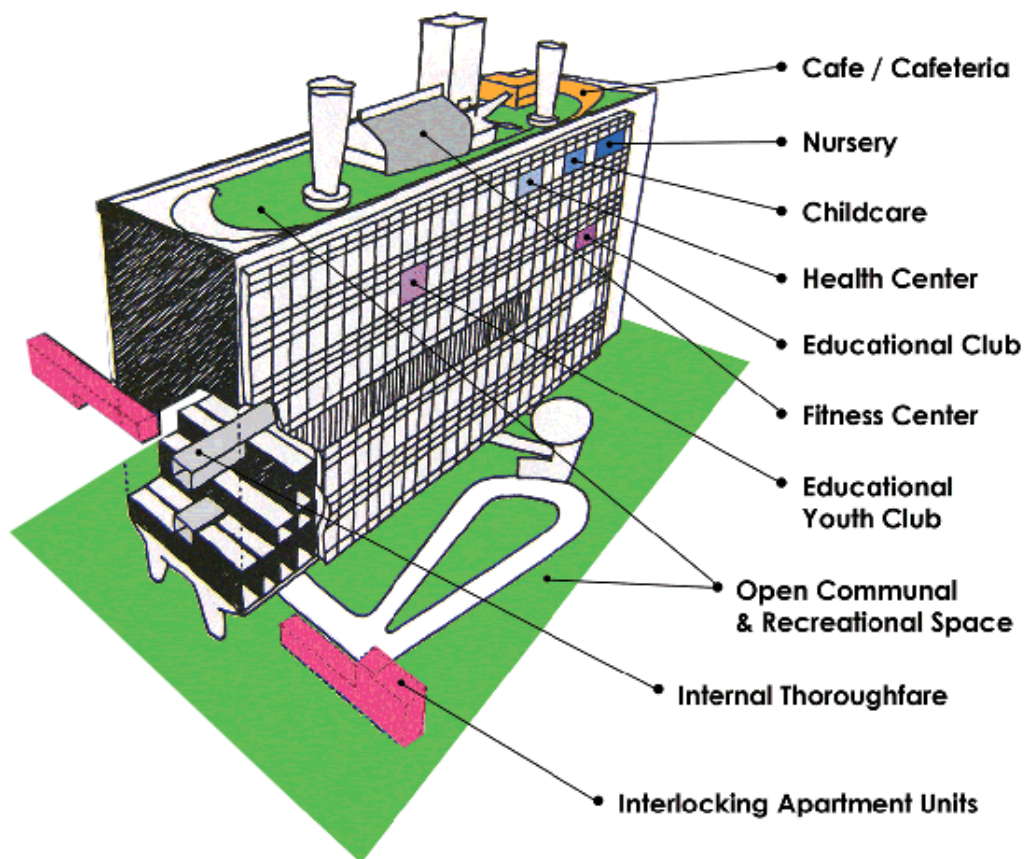


Figure 6- Functional perspective of Unite de habitat

It must be said, a building that presents a new paradigm is one of the most complex design exercises that an architect has to go through. Here, this building perfectly shows (other than climate) that how to reduce the footprint of a building and how to provide functions according to content, context, user group, and separate public and private spaces. It will also be a great example if the whole layout is remodeled when a prototype is constructed in any other climatic region. He showed that all people deserve to live in a high-rise and they can maintain the aristocracy of space as well as generate a healthy community. The fun fact is this building is still occupied by the middle class people. That's how a sustainable building should be.

Through this section, we can see that the minimum needs are served in each unit. Natural lighting and ventilation is welcomed in each room but is sometimes compromised in the lobby area. On the other hand if we see the lobby areas, they are situated after each three floors reducing the portion of unused areas also. Nearly 1600 people living in an 18th floor building with proper facility and healthy spaces made this building “A city within a City”. One of the most interesting thing is the dwellers were employed at the time of construction. That is also

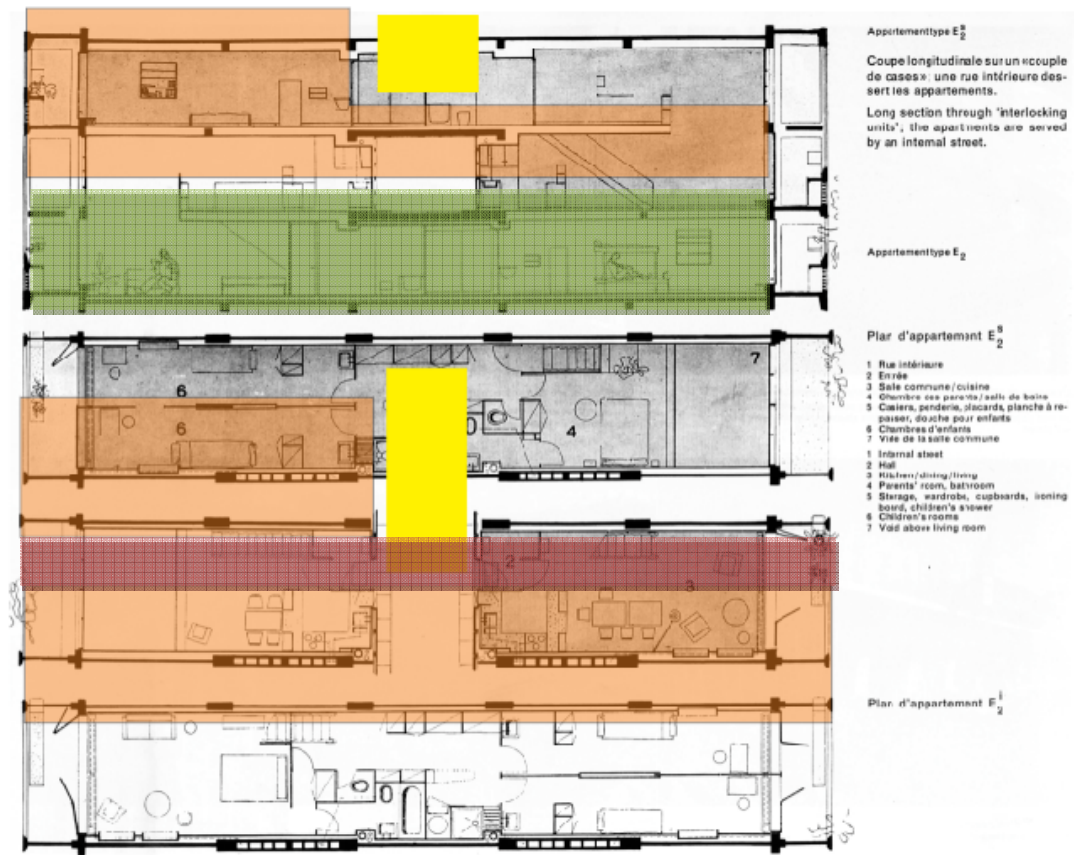


Figure 7-Sectional flow of the floors of the Unite de habitat

a mile stone for sustainable architecture. As his idea was “vertical garden city” based on bringing the villa inside a high rise building which facilitates the inhabitants to have their own private spaces, but outside of that private sector they would read, play games, shop, eat, exercise and make the community gathering. (www.BBC.com/culture n.d.) (www.archdaily.com n.d.)

Artist Village by Charles Correa

The zest of his concept for this project is architecture which is a social art, needs inputs from society in terms of society's mind set, society's technical development, awareness and aspirations. Architecture no matter how good on paper, when actually manifested as a built form shows where the society stands in its development. In India most planning schemes are bound to fail unless there is awareness amongst people. There will never be improvement in the built form, if the deep rooted issues of the Indian mind set in terms of 'beauty', 'civic responsibility' are not addressed." Thus he made a dense place for living for the artist so that they can create art forms through the dramatic changes and phases of life.



Figure 8- - Master plan and mass flow activity of the Artist village by Charles Correa

The architect identifies the process through which has to work in India as outdated, fragmented and ugly. He was asked to make a place in a clustered and ordered manner so that it may be easily maintained. But he gave the answer like this way, "an artist keeps his creation clean and thus he himself has no time to get tidy." He mentioned that it's important to serve the artist through their manners. Not by other's. From a forum, we find that the painter's review is very good and they are very pleased to live in there.



Figure 9 Daily activity through time and Birds eye view of Artist village

It's a discovery for a life time for an Architect. (www-foundationsackc-com-projects n.d.). It is important to serve the end user, not others. In addition, the architect must also ensure the natural lighting and ventilation along with good orientation to the climate. And he has to provide places for cultural activities such as back yard gardening and front porch gathering spaces as they had in the past. He also provided a central space for all the artist to gather in weekend so that they can socialize.



Figure 10- Open Canvas of Artist Village

From each project, I have found several things that will help in my thesis work. These case studies also helped me to know detail about how an architect thinks before the design phase start and between the processes. The following analysis of key features will be helpful for me to think in a process for the design of my thesis.

	Arannya housing	Artist Village	Unite de Habitate
climate		●	
context	●	●	●
Culture	●	●	
user group	●	●	●
income	✓		✓
profession	✓	✓	
religious factor			
age group	✓	✓	✓
activity pattern	✓	✓	✓
community		✓	✓
social infrastructures	●		●
community purpose			●
source of income	●		●
Active user group		●	●

Table 2- Comparison between the designed housing systems

RESEARCHES ON PARTICULAR CASES

Shakhari Bazar (dwellers living in historically important buildings announced as heritage)

Site background

Shakhari Bazaar is the oldest city of Bangladesh, which left its mark on this precious little mohalla that shares a long history of more than 400 years with Dhaka city. The history of Shakhari Bazaar goes back to the Mughal days. Puran Dhaka can be found in the writings of Mirza Nathan, the general turned historian. He mentioned Puran Dhaka, as the area between Dholai Khal and Buriganga river covering Shakhari Bazaar, Tanti Bazaar, Bangla Bazaar, Lakhsmi Bazaar, Bangla Bazaar, Kamar Nagar, Sutar Nagar, Goala Nagar, etc. Each mohalla belonged to separate communities depending on their craft and trade. The influences of the Mughal vocabulary in the planning of the spaces are literally evident in the use of Persian names to identify different spaces. (bdnews) (Tribune n.d.)

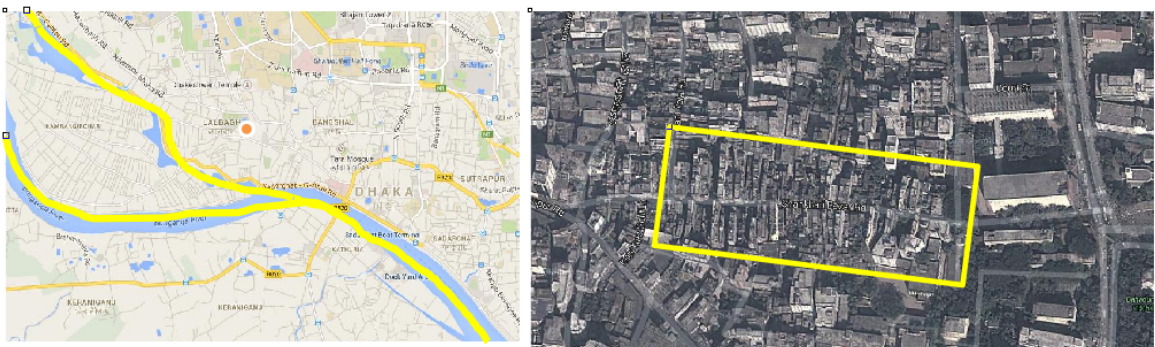


Figure 13-site showing Shakhari bazar area

SAKHARI BAZAR- DAILY ACTIVITIES



lack of utility
improper Setback
unhygienic
poor
infrastructures
over populated
chaos of functions

Figure 11 - Day to day life of Shakhari Bazar



Figure 12- Street life and activities of Shakhari Bazar

Urban Context

People in there have lots of potentials. They can actively take part in the activities into the economy and culture of the country. They are producing rare items which cannot be replaced or reproduced because that needs expert craftsmanship and experience. On the other hand, they are one of the ancestors of the city. They deserves one of the best service from the government. Their houses are in a very poor condition and needs to be retrofit or rebuild.



Figure 13- Heritage buildings and their recent condition

Culture and norms

SAKHARI BAZAR- CULTURE AND RELIGION



Figure 14- Religion as a part of culture

SAKHARI BAZAR- Bengals



Figure 15-Craft items as a part of cultural responce/ representative

Bihari Camp (post war refugees)

Site background

Bangladesh Government announced the Presidential Order 149 in 1972- as a step towards offering the Bangladeshi citizenship to these Bihari people. According the Government sources nearly 600,000 Biharis accepted the offer. Later, these people assimilated with the larger population and settled down properly. But at that time, a survey was conducted by the ICRC (International Committee of the Red Cross) which found that 539,669 Biharis wanted to go back to Pakistan as it was their country of nationality. ICRC started registration for the repatriation of these people without any legal sanction from either the countries. (Tribune n.d.) (bdnews)

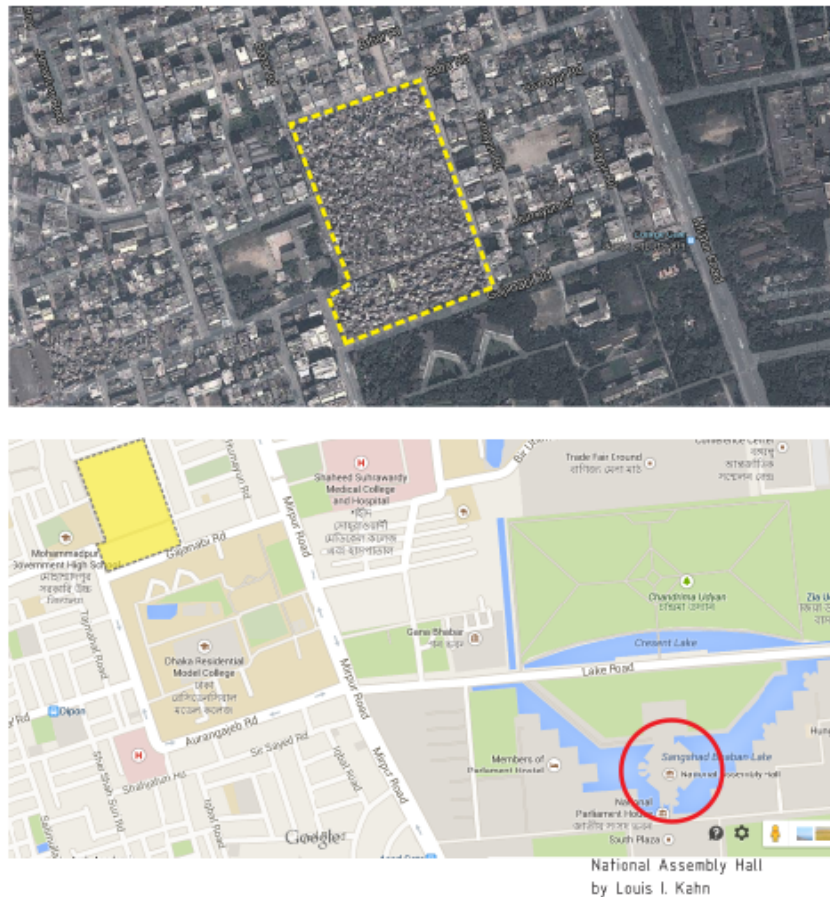


Figure 16-Site study and land use of the **Bihari Camp**- Dhaka

The word 'Bihari' literally means a person who belongs to the state of Bihar of India. In Bangladeshi context any one who speaks Urdu is considered to be a Bihari whether that person comes from Bihar or not. Before the Bangladesh Liberation war in 1971, Pakistan Biharis came to East Pakistan in different phases. They were considered as citizens of Pakistan. After the independence of Bangladesh, the Pakistani army evacuated and these Biharis were left behind. Bangladesh scorned the Biharis for having supported the enemy and an anti- Bihari sentiment instigated political persecution and their homes and properties were taken over by the Bengali's. After the creation of Bangladesh, almost all Biharis were fired from their jobs on various pretenses. Bihari children were expelled from schools. Bihari pensions, bank accounts and investments were seized. As a result, by mid-1972 nearly one million Biharis found themselves in temporary camps set up around the country. (Tribune n.d.)

Culture and norm



Figure 17-present condition of the refugee camp

Later, Pakistan refused to recognize all these Urdu speaking people as her bona fide citizens who already declared themselves as Stranded Pakistanis by registering with the ICRC. Islamabad

showed little interest in repatriation because to them they were basically Indian refugees. During the first year of post liberation period this community was quite confident that Pakistan would welcome them as their loyal citizens. From their side, all efforts were made through ICRC and other sources to influence the concerned authorities that the only solution to this problem was repatriation to Pakistan. (Ashraf 2012)

Life style

In December 2008 general election in Bangladesh, a portion of these Bihari people who were born after 1971 were able to cast their vote for the first time as the

Livelihood



Figure 18-Life style and current situation

citizens of Bangladesh. They are also registered for the National ID card which is associated with getting many benefits in social, economic and political life. In September 2008, Caretaker Government of Bangladesh took this laudable step to reduce their stateless situation.



Figure 19 - broken infrastructure

(Tribune n.d.) (bdnews)

A boy embroiders a length of silk in Dhaka's Geneva refugee camp. The camp houses over 500 Urdu speaking families known locally as Bihari's and who originally came from the East Indian state of Bihar at the time of partition in 1947. In the Bangladeshi war of independence in 1971 they sided with Pakistan and today still consider themselves to be Pakistani. The camp is notorious for its cramped living conditions, poor sanitation and shortages of electricity and clean water. Families usually live, sleep and eat in a 4 square meter room. There are two water pumps in the camp but these often produce water unfit for consumption.

(Snow n.d.)

Culture

The mud brought from the graveyard and placed inside the tazia is supposed to represent the tombs of Hasan and Hussain. Nobody should see it and this is why the Khalifa [who is responsible for the processions] covers it up with a red and a green cloth or paper to represent the tombs of Hasan and Moharram, drumming Hussain respectively. Hussain died by the sword [red cover] and Hasan was poisoned [green cover]. The tazias are taken out on the night of the

Community and Festivals



Figure 20-Festivals

tenth day. A small procession is organized amidst a lot of drum-beating and mock fights with swords and sticks and fire – performances showing off physical prowess and daring. This usually happens in the various camps – just outside the entrances on the main streets and between midnight and 2.00am. During the afternoon of the next day, the tazias are paraded amidst much pomp through the streets from one camp to the next. Thousands of people watch or join in these processions during which there is the usual drum-beating, swordplay, fire-eating, etc. We have a lot of fun. (bdnews)

Festivals

Muharram processions in Dhaka where Muslims of the Shia group observe the first ten days of the month as a period of mourning for the death of Imam Hussain. Dhaka, Bangladesh. 28/12/2009. Muharram or the 'sacred month' is the first month of the Islamic or Hegira calendar. The Hadith instructs to observe fasting on the 9th and 10th of this month. Fasting on ashura (the 10th of Muharram) was a faraz (obligatory) until fasting in ramadan was made faraz. Both in pre-Islamic times as well as at the time of the Prophet muhammad (Sm), it was haram (forbidden) to be in war in this month. Muslims of the Shiah group observe the first ten days of the month as a period of mourning for the death of Imam Husain (R), the grandson of Hazrat Muhammad (Sm). The tenth day of Muharram is called Ashura. Imam Husain (R) was killed on this day at the hands of the troops of Yazid, the son of Muawiyah, the Umaiyya caliph. Shiahs take out processions with tazia, the replica of the tomb of Imam Husain (R) and they show their grief by clapping on their chests or flagellating themselves with knives or chains. The mourning continues for forty days till the first ten days of the next month Safar. Muharram had been observed since the 10th century. In Bengal also it has been observed for the last few centuries. The centre of observances of Muharram in Dhaka is the husaini dalan Imambara. As mark of

mourning, Shiahs dress in black for at least ten days of Muharram. During this time, they refrain from merrymaking, listening to music, or seeing plays or movies (Tribune n.d.).

Strategy For The Development of Bihari Camp

Government can earn lots of remunerations by using their craftsmanship and labor.

Preserve nationality and basic infrastructures.

Provide education for the children.

Government can't move them from the city because they own the property from Geneva Conv.

The developer company are not interested in here because it's not a profitable to them.

They contain the rich culture that is going to be lost.

They plays an important role in the economy as they are the best cook, craftsmen, repairman, and hardworking laborer in the town.

A sustainable design solution can solve all the problems heading around this area.

LOCAL MATERIAL STUDY AND SCOPE ANALYSIS

Some local materials are very famous and cheap in our country. They are wood, bamboo, Clay, straw and mud mixture, cane and straps from cane. They are used in different purpose.

Structure

Envelope

Floor cover

Wall cover

Roof

Insulation

They also have different strategy to use same material in different purpose. We can use bamboo for structure and wall both. The picture demonstrates that well. Except the footing, everything in the building can be done by bamboo. Some uses concrete for the foundation.



Figure 21-Building uses local material

In our country, bamboo strap is very popular and widely used in the building. It's also obvious that the straps are easily found and cheaper in price. In some cases, we also use this material for interior and exterior decoration.

For strengthening, bamboo is used with cane for different purpose. Some uses jute fiber or steel to tighten up with another bamboo and some uses mud to cover up the holes onto it.



Figure 22-Building elevation with Vernacular material



Figure 23- Use of mud in Building elevation

As we can see the structures are made with the help of bamboo and the base material of the wall is mud. But truly they have used bamboo as a structural element for that.

As a roof support, bamboo is a very good solution. It has a higher bending moment. That's why we can use it as a supporting structure as well as timber. On the other hand, doors, windows, seething and insulation can also be done using bamboo. It's a very good material as its weather protected. We can see that the process is also simple and fast. On the other hand we

will have a durable and strong system for the house. It's also doesn't take expert and expensive labor.



Figure 24-bamboo used for the whole building

-One billion people live in bamboo houses. In Bangladesh, 73% of the population live in bamboo houses. Bamboo provides pillars, walls, window frames, rafters, room separators, ceilings and roofs.

-It has been calculated in Costa Rica that only 70 ha of bamboo plantation are sufficient to build 1000 bamboo houses per year. If these houses were built with timber, 600 ha of natural forest would be destroyed each year.



Figure 25-Cultural motif

-Studies show that processing of bamboo requires only 1/8th the energy for processing of concrete and 1/3rd of that of wood to create a building material of the same capacity. In comparison to steel, bamboo needs only 1/50 of the energy for processing (Roach 1996).

While much of modern-day building in China is done with steel and concrete, ancient Chinese intellectuals preferred living in retreats made of bamboo, a plant whose qualities were often likened to the character of an honorable man.

In Yunnan Province, which borders Sichuan, the Dai minority still lives in bamboo homes. And in affluent Zhejiang Province, where bamboo is plentiful, local officials have been encouraging architects to design recreational infrastructure using bamboo.

(Architect

n.d.)



Figure 26-Bamboo Houses Stand Up To Earthquakes and easily found

"So far, massive construction or reconstruction means concrete structures in China, and bamboo is little known for this [building on a large scale]," says Shayam Paudel, INBAR's director of bamboo housing programs, in the Christian Science Monitor. Unlike the "Tofu" concrete structures that collapsed and killed thousands of kids in substandard buildings, bamboo makes a much simpler structure.

(D. g. Architecture n.d.)



Figure 27-Construction of the walls and producing raw materials

DESIGN PROCESS

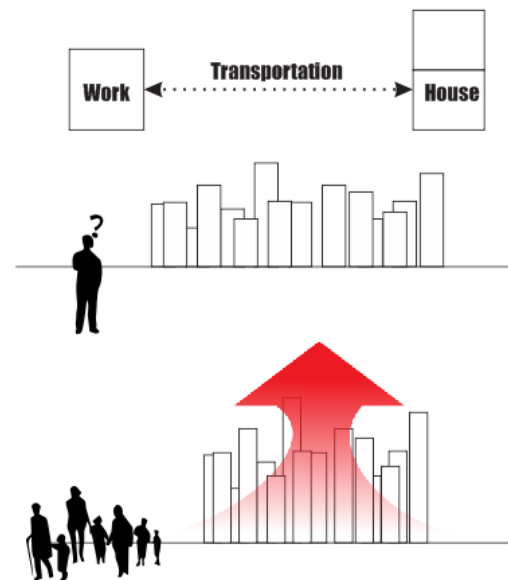
SITE FOR THE PROJECT:

If I go through the chronological development of the site, we can see that the whole area were used to be a swamp and for the need, people encroached the water body and built houses. So the soil quality is so strong to stand with the multi-story building but it can be a good place for the cultivation and irrigation.

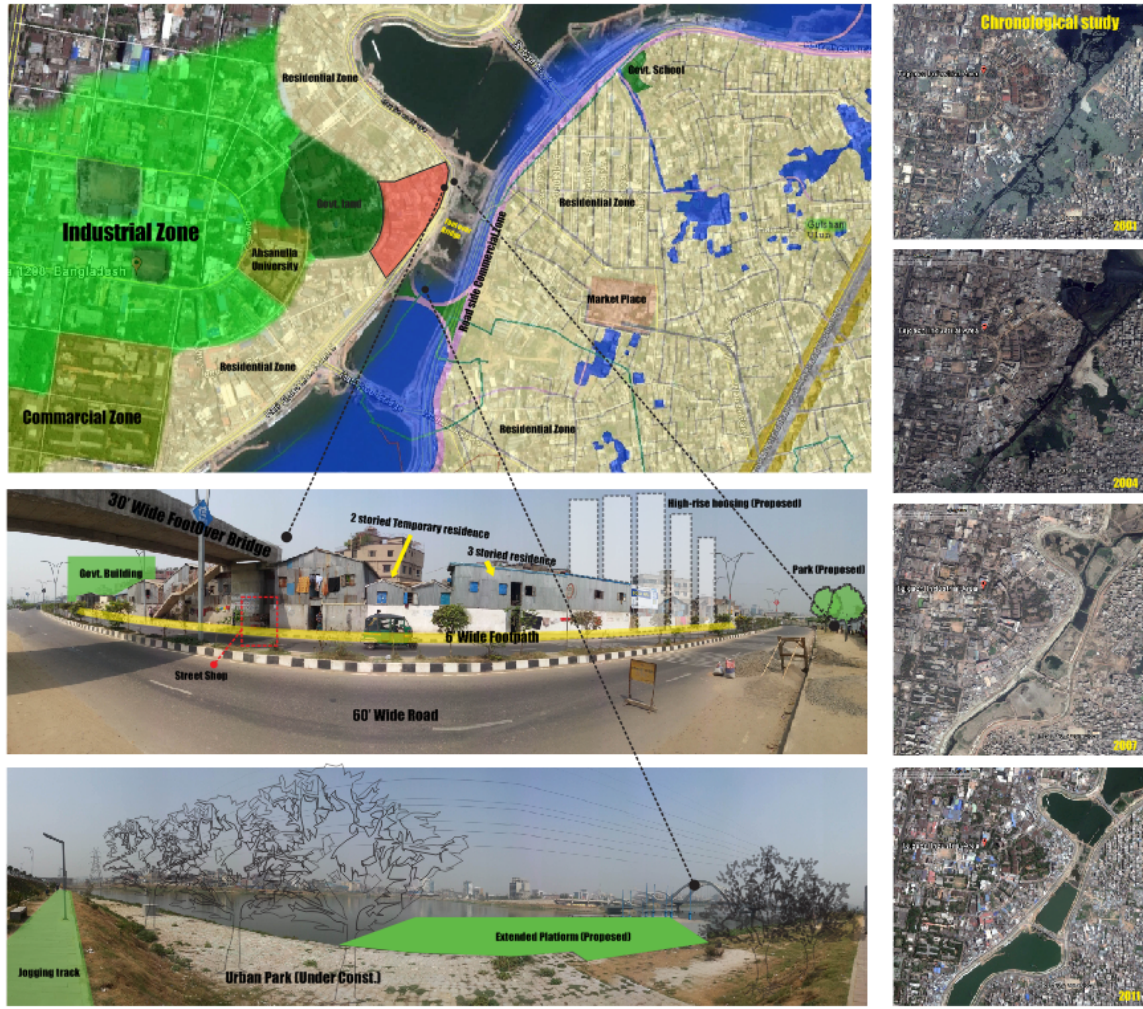


Site Problems

- Overpopulated and expensive life style
- Lack of work and facility for Urban poor
- No reflection of culture, religion
- Craftsmanship Vs. Industrialization
- No use of local materials
- No place for neighborhood community
- No Gathering place for women



Site surroundings and context



The site as mentioned at the top has described the land use pattern and the zoning of that area. Besides some of the images contain the existing condition of the site. On the other hand, the future projection has also been demonstrated with the help of graphics. Some of the government proposals are also described here with the help of graphics. The future projection also shows that the site does not have proper infrastructure to support such a project. That's why I have to design the other services and infrastructure to meet the program.

ENVIRONMENTAL AND CONTEXTUAL ANALYSIS OF THE SITE

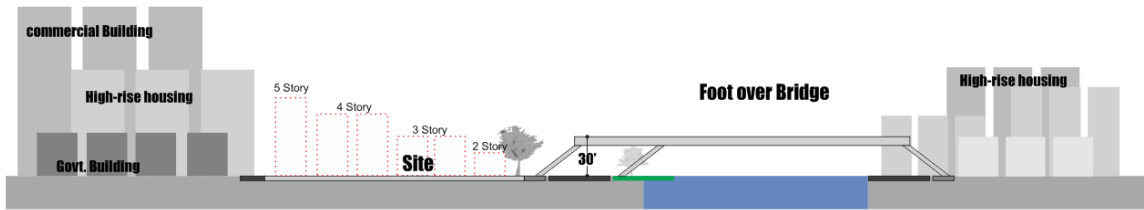


Figure 28-Section of the site

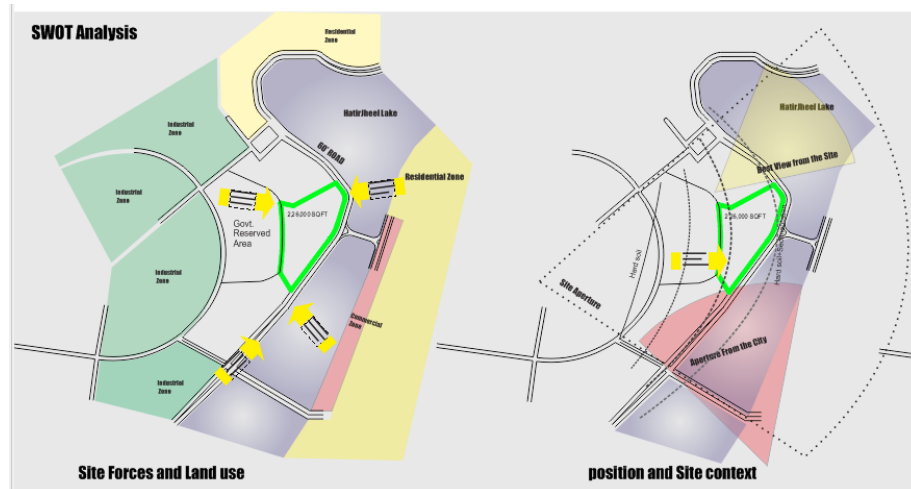


Figure 29-site condition and its SWOT analysis



Figure 30-Climatic analysis



Figure 31-the site with its accessibility and services



Figure 32-site with its existing features

MASTER PLAN STRATEGY

Block layout

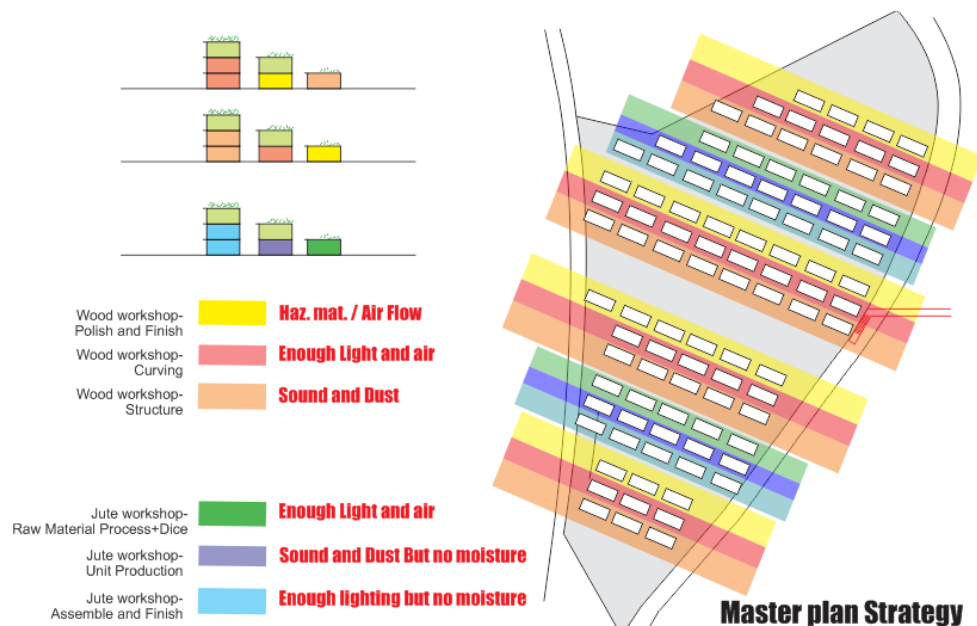


Figure 33-Housing block layout

Circulation pattern and Accessibility

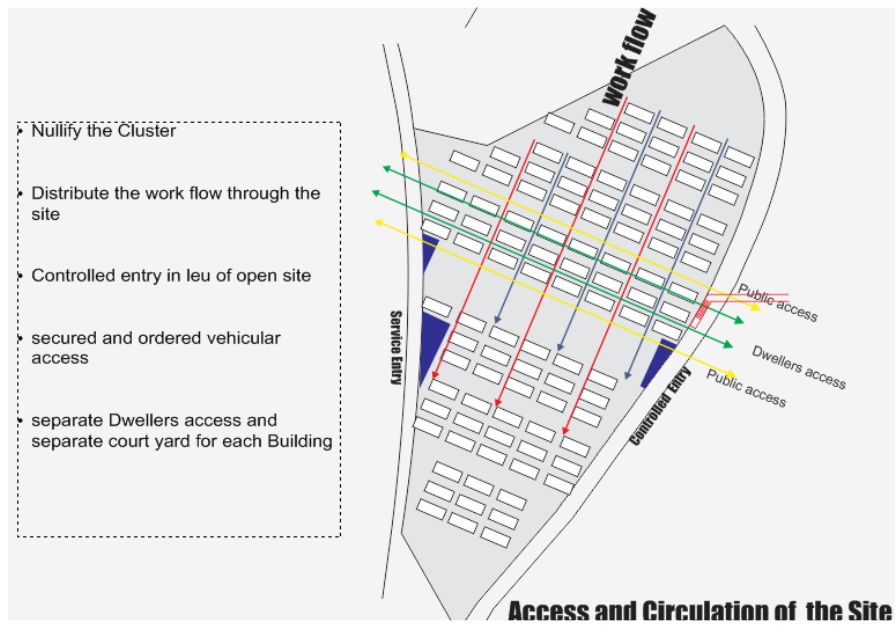


Figure 34-circulation

Ancillary facilities

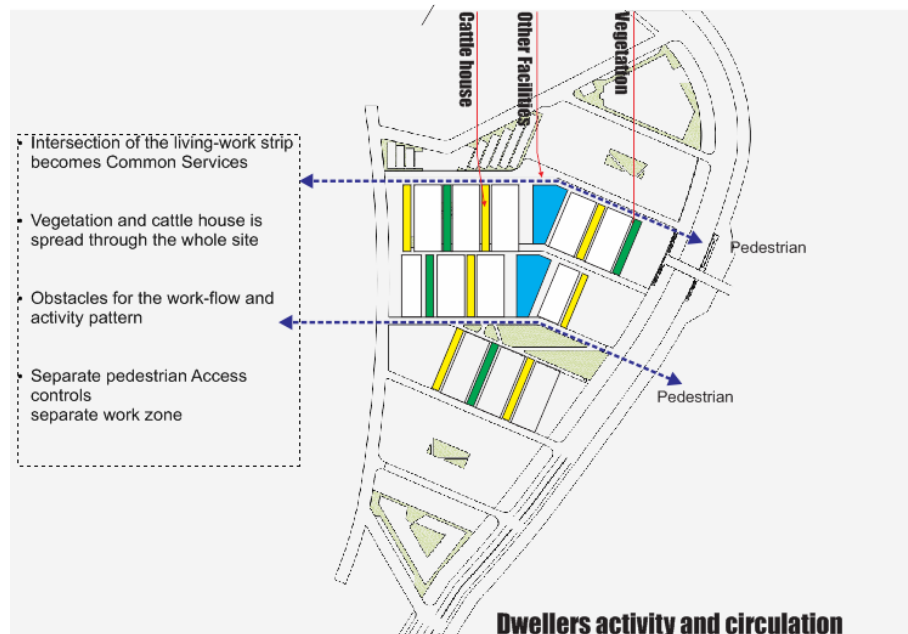


Figure 35-vegetation and Cattle rearing

Other Facilities

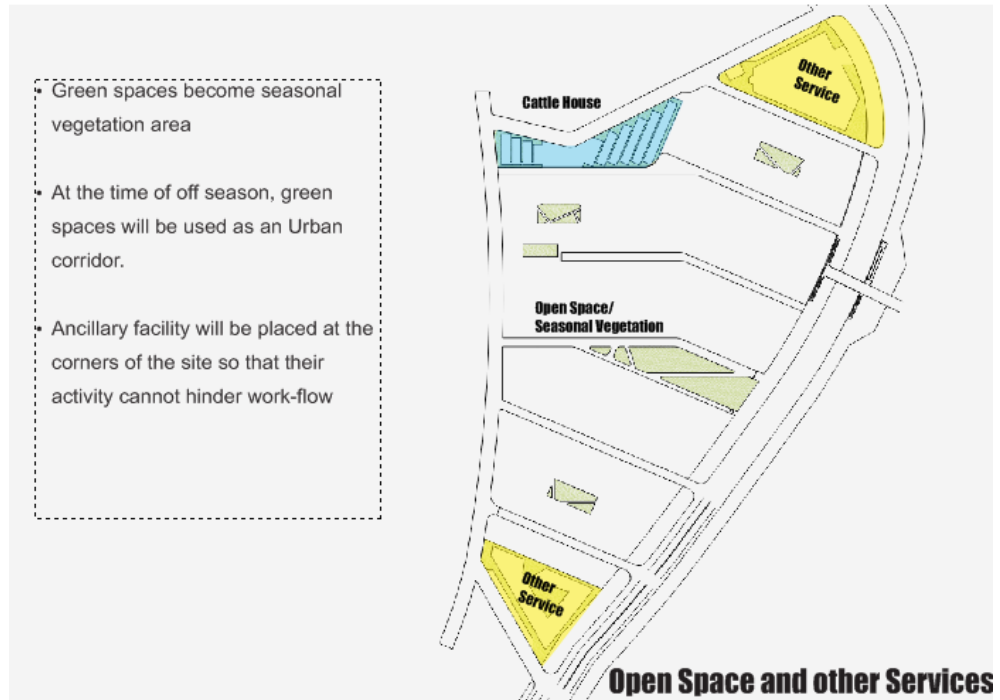


Figure 36-Supporting services

Climatic consideration

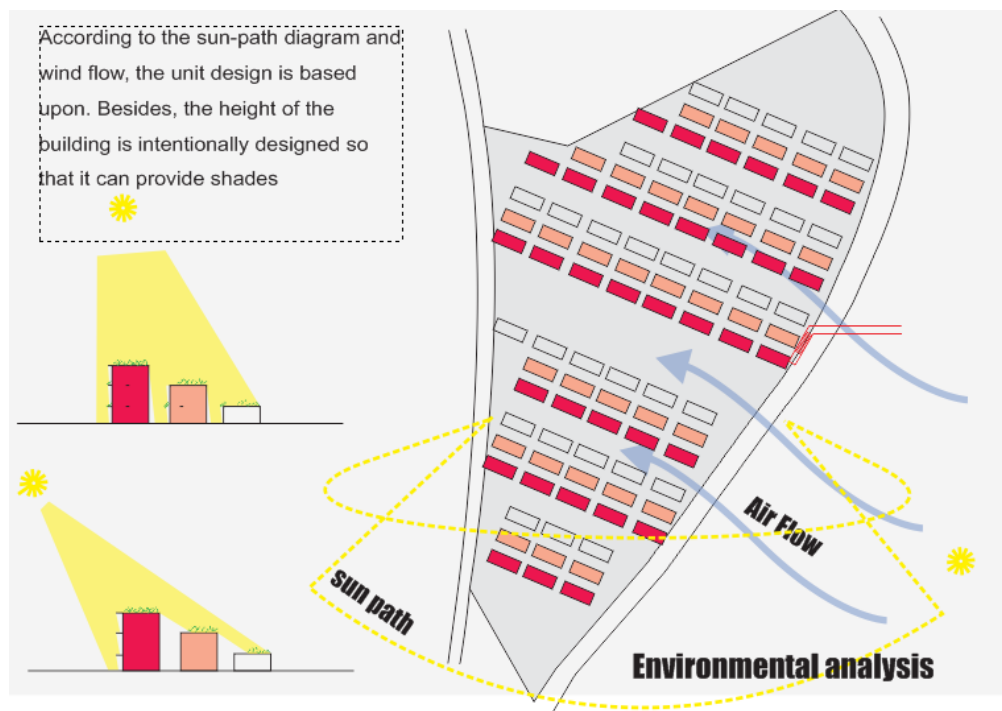


Figure 37-Air flow and sun path diagram for the site

Master plan

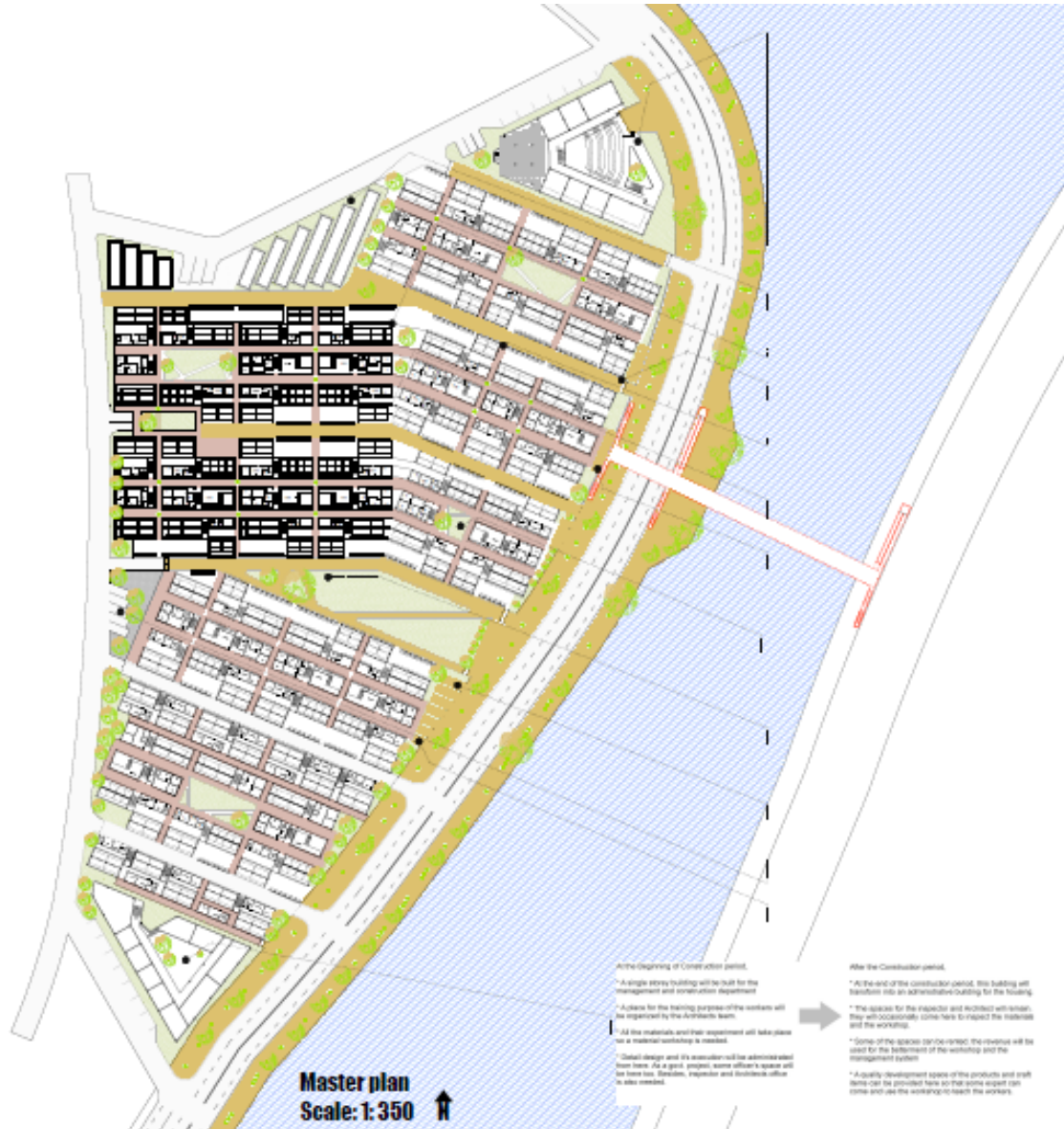


Figure 38-Master Plan

Craft Based Program Development

Wood and Bamboo Worker's activity layout

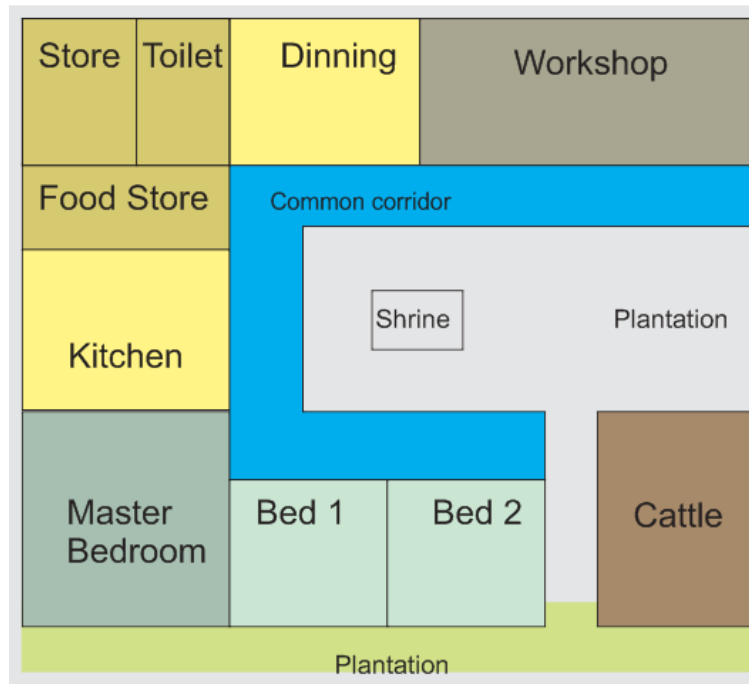


Figure 39-Typical layout for wood worker's house

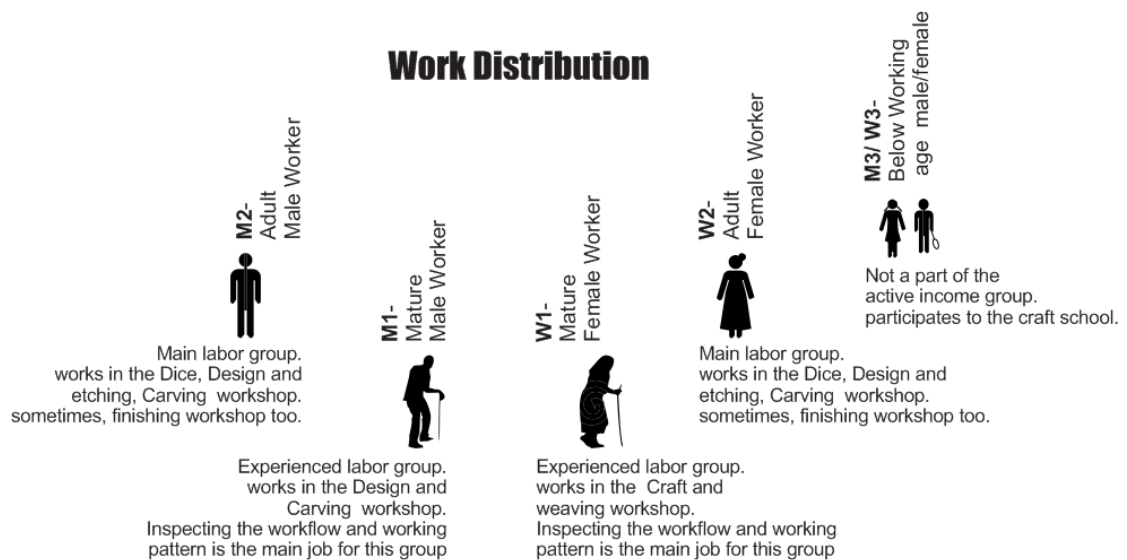


Figure 40-Work Distribution



Activity flow of **W1**

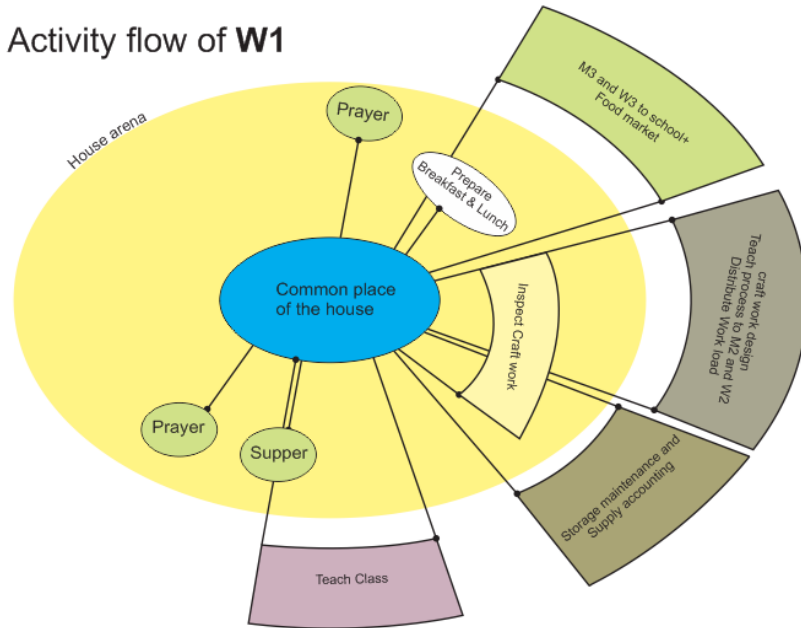
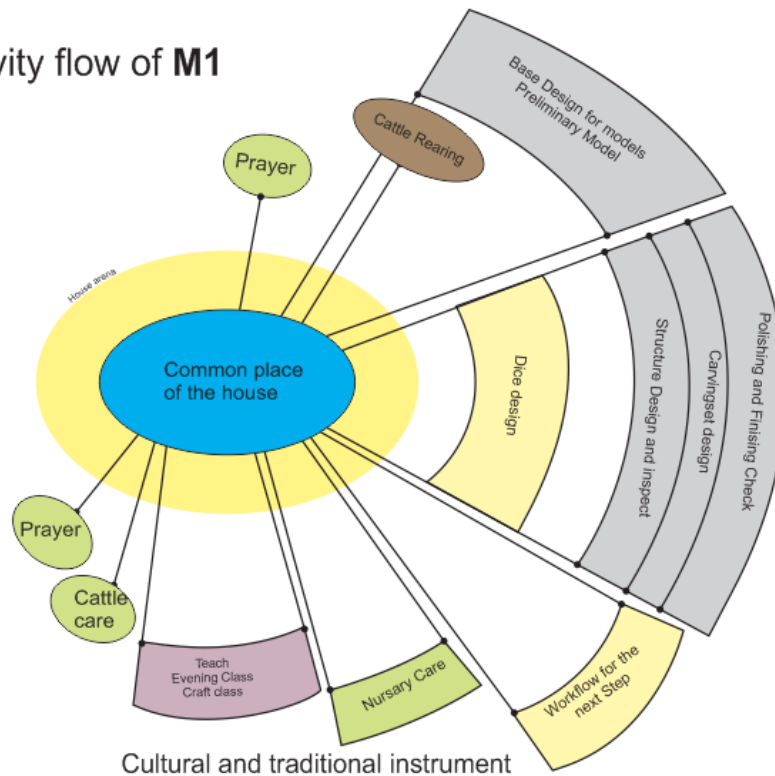


Table 3-Activity flow 1



Activity flow of **M1**



Cultural and traditional instrument

Table 4-Activity flow 2



Activity flow of **W2**

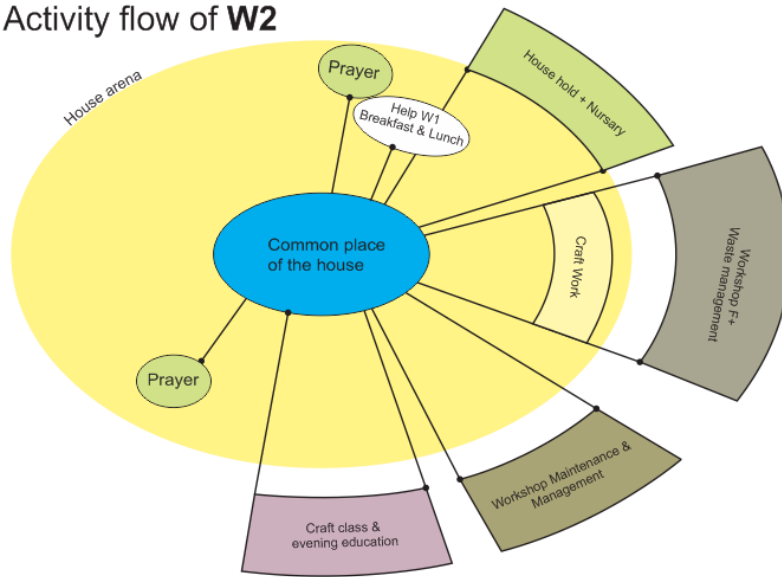


Table 5- Activity flow 3



Activity flow of **M2**

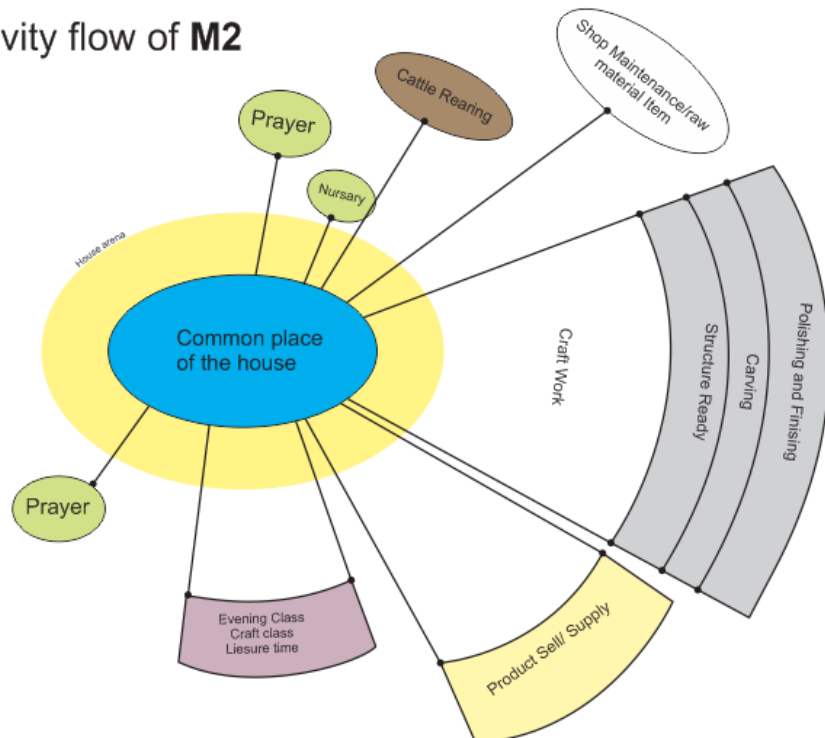


Table 6- Activity flow 4

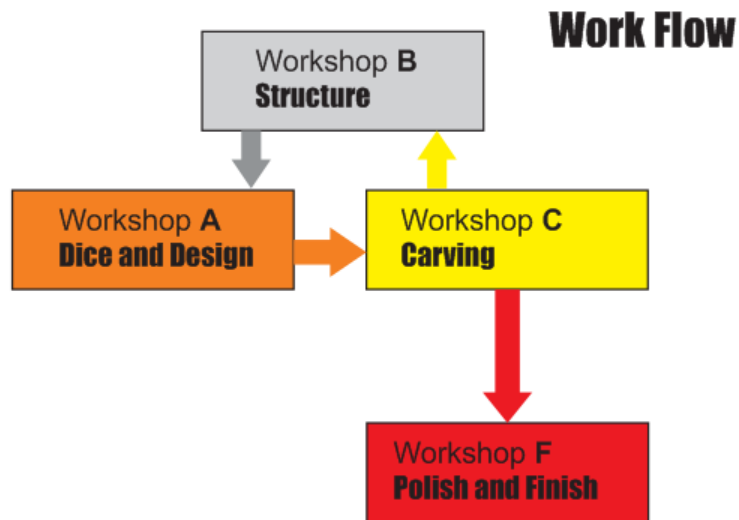


Table 7-Work flow

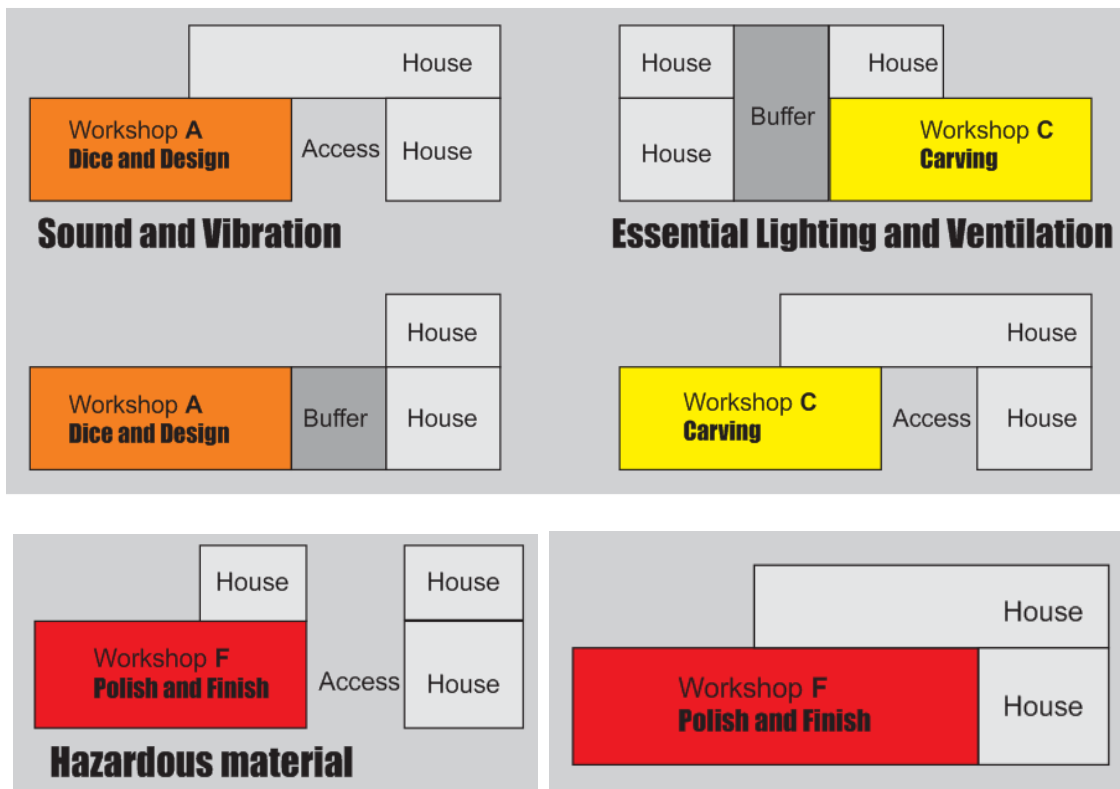


Table 8 -House pattern

Jute and Cane worker's activity Layout

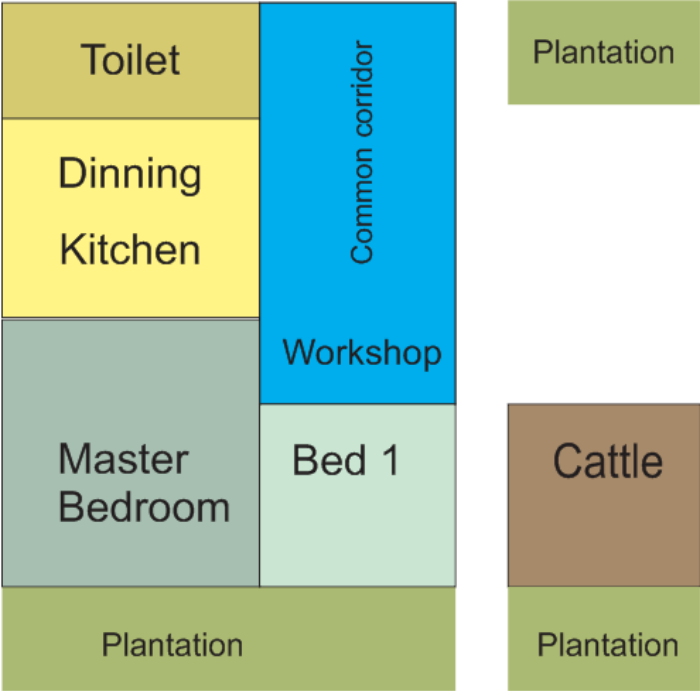


Figure 41- Typical layout for Jute worker's house

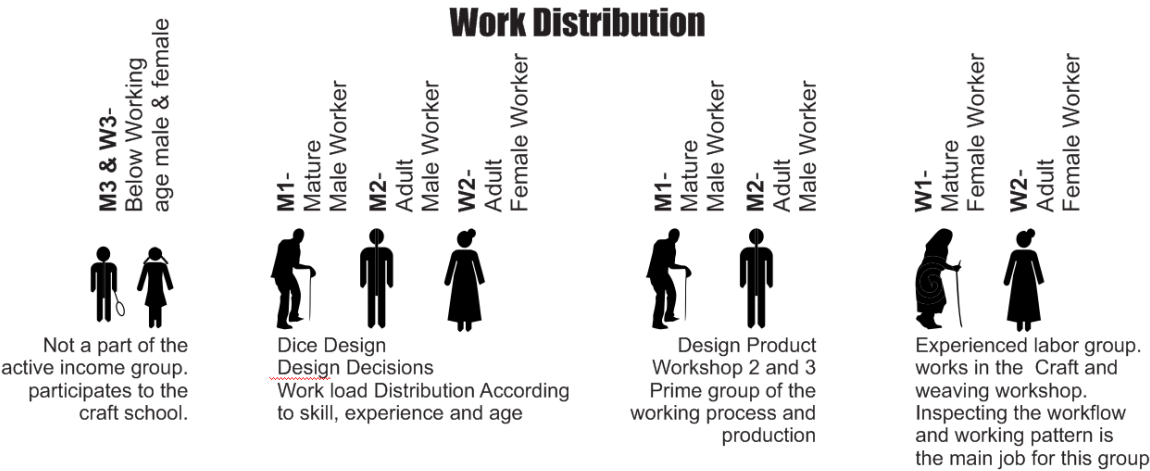


Figure 42- Work Distribution

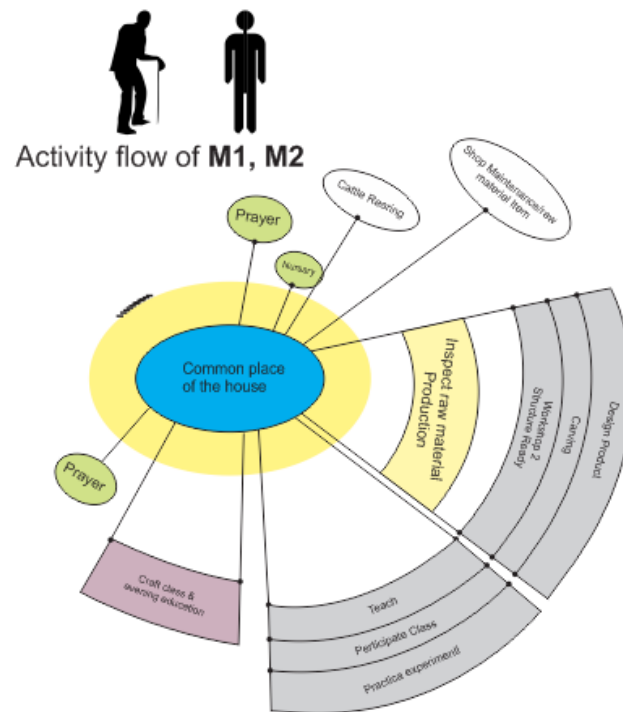


Table 9- Activity flow 1

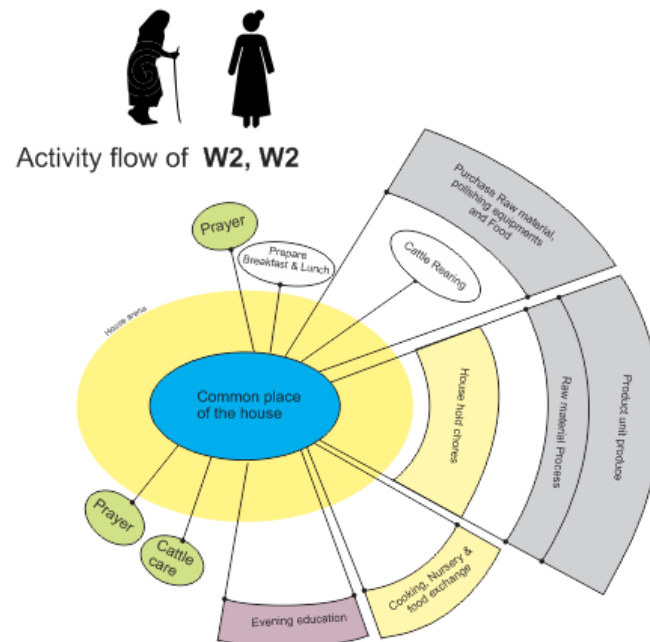


Table 10- Activity flow 2

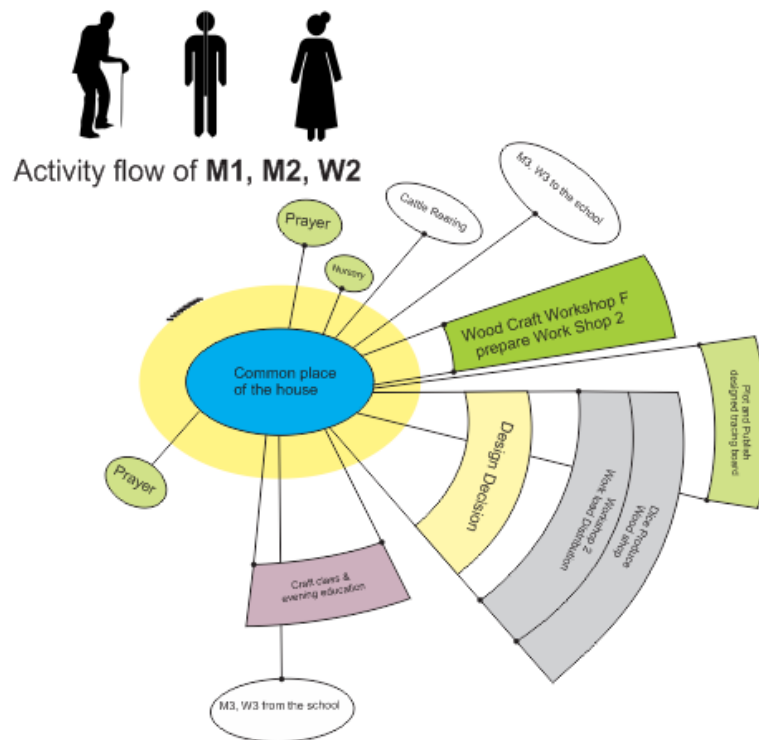


Table 11- Activity flow 3

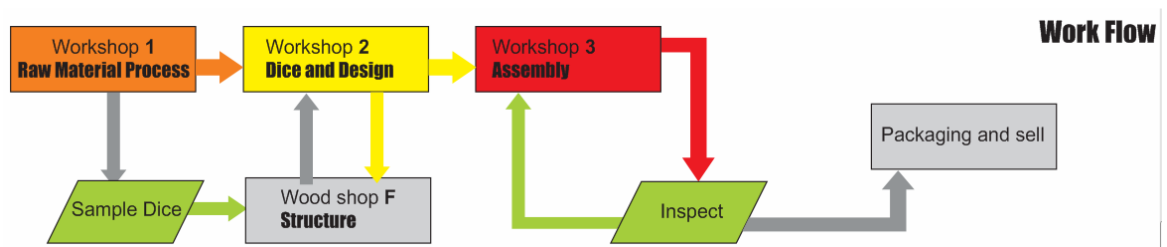


Table 12- Work flow

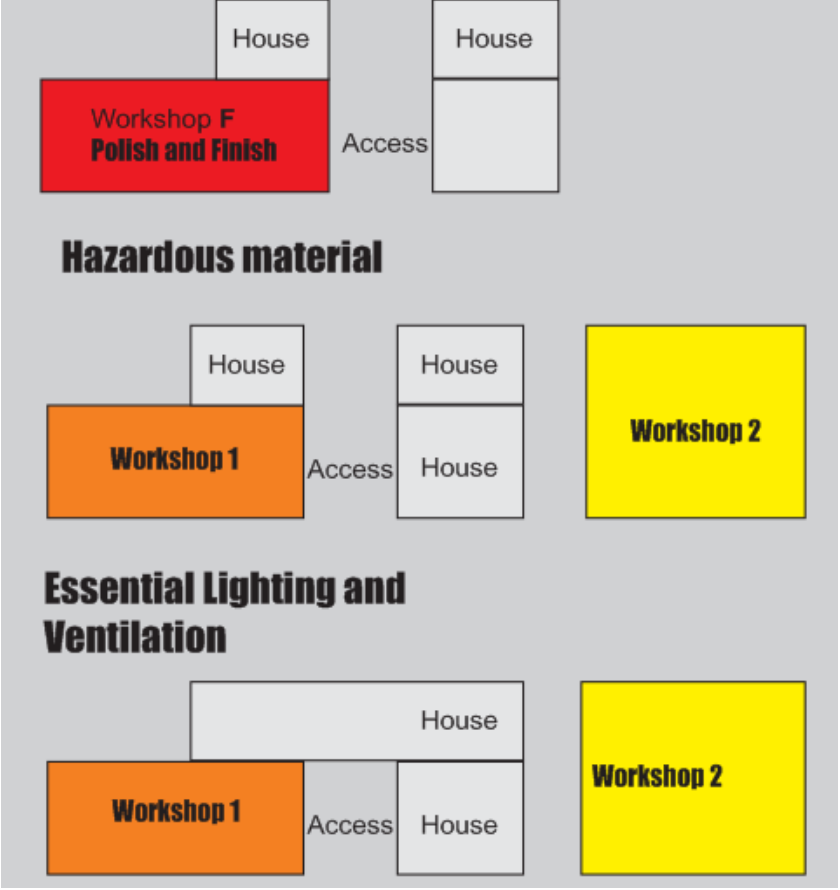


Table 13-House pattern

Building Block

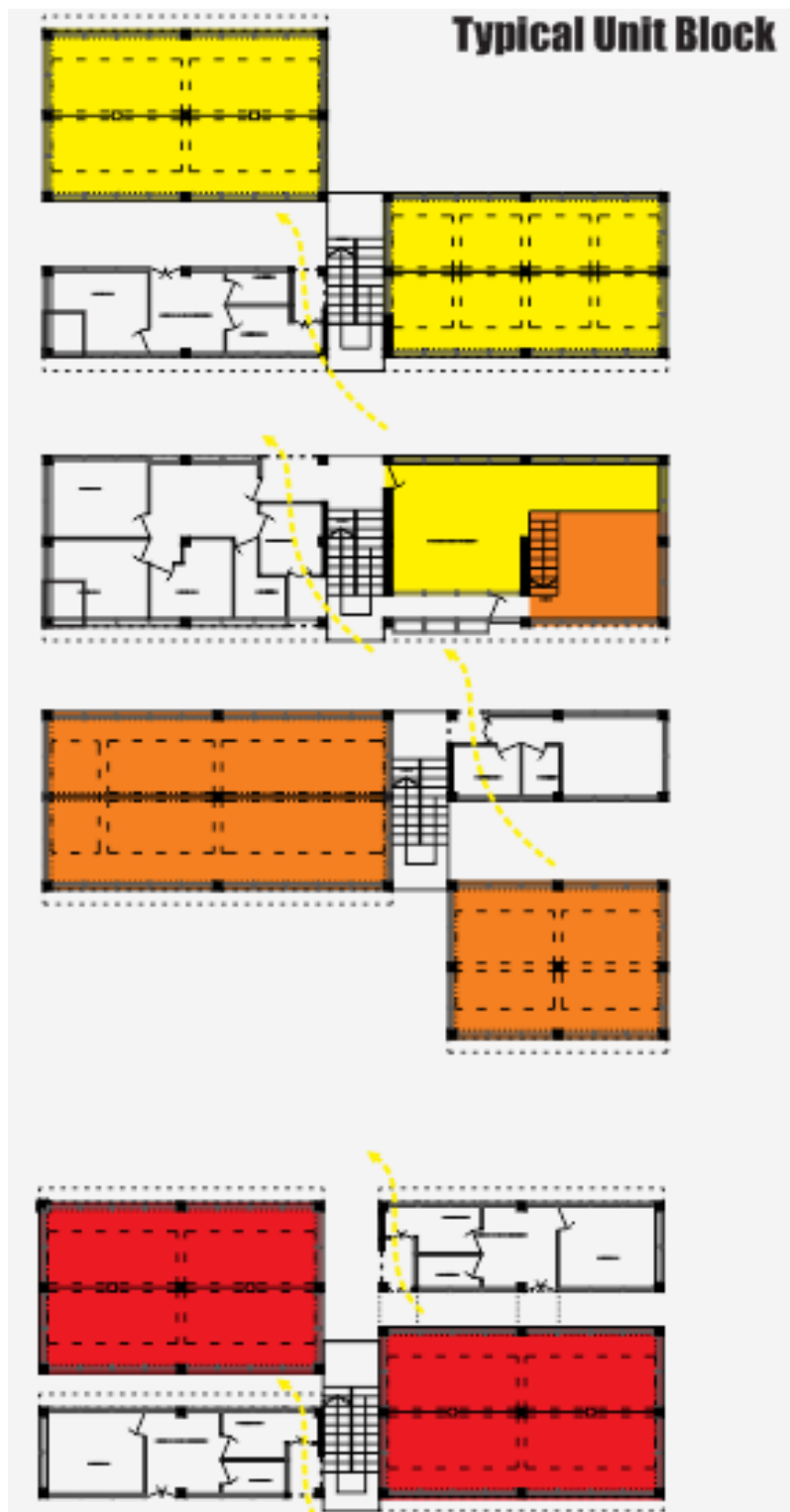


Figure 43- Typical unit block

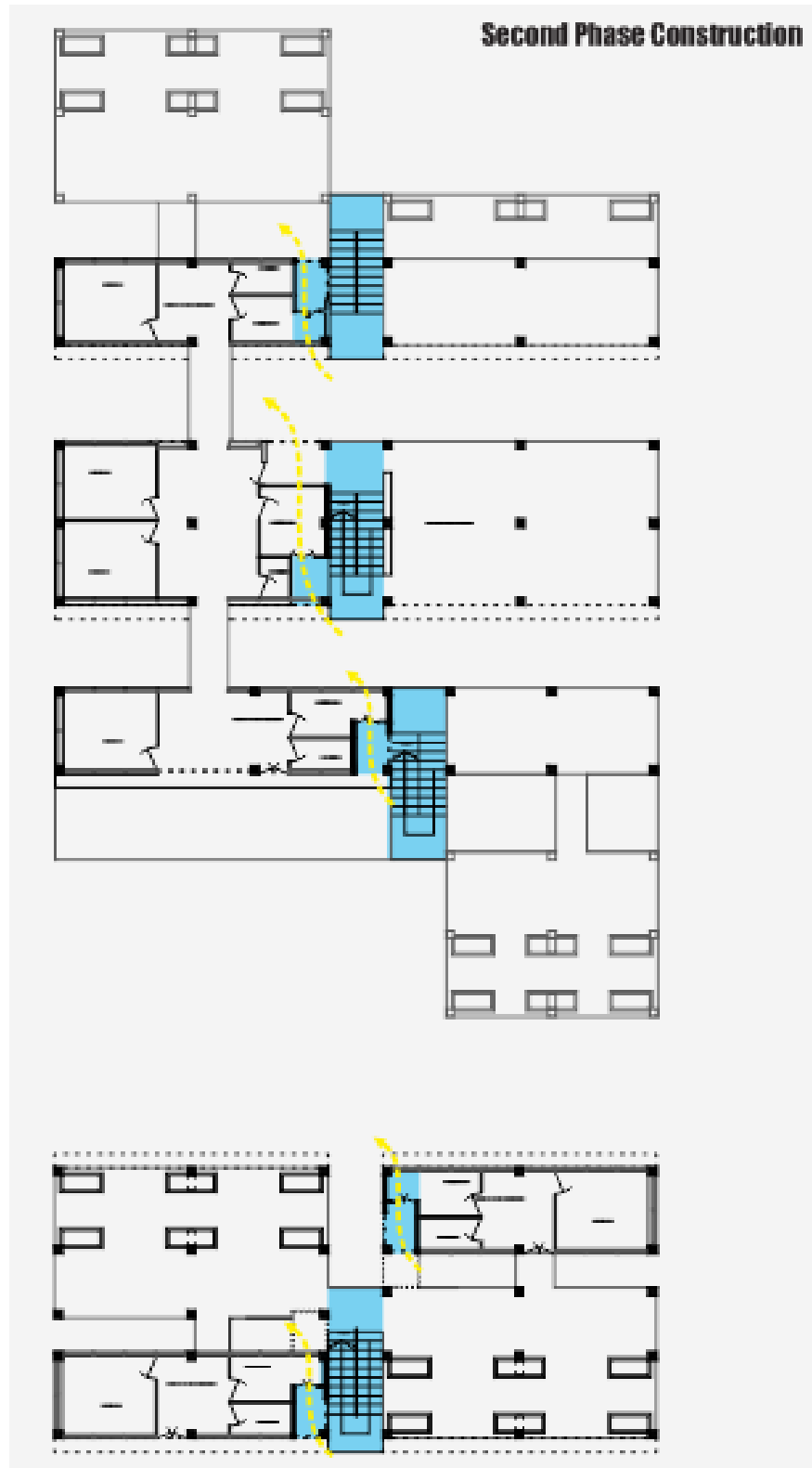


Figure 44- Core, Air circulation and Further Extension



Figure 45-Wood and Jute worker's house and maximum extension

Activity through the Building units



Figure 46-Section showing the activities of the dwellers

Construction Process Through Phases:

- * The core of the building will be cast with concrete as for the site it is the fastest, durable and cheapest (according to labor cost) process.
- * When the core is completed till the first floor, it will provide some provision for the extension.
- * After several years, there might be needed to extend the house and the workshop. Each of the workshop has 15% extension; now used for plantation.
- * All the core that have been cast before has a chance to extend vertically with the cast of the slab. The elevations will be set then.

Wood Workshop and Wood worker's House Detail

Wood Workshop

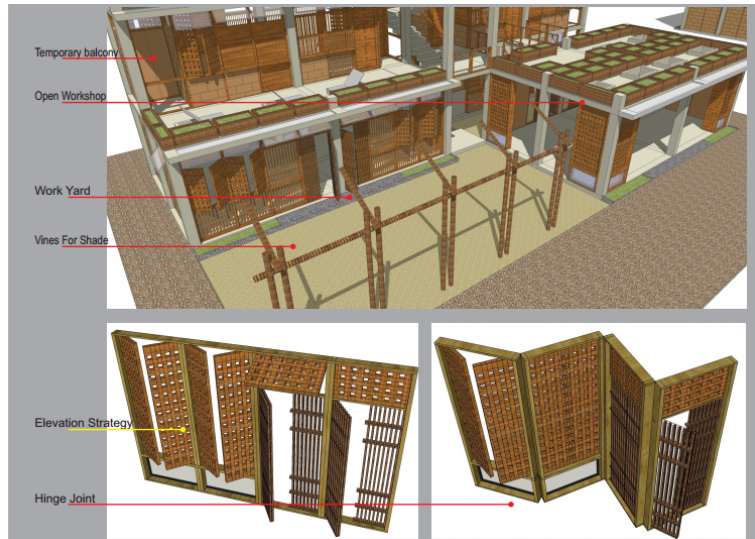
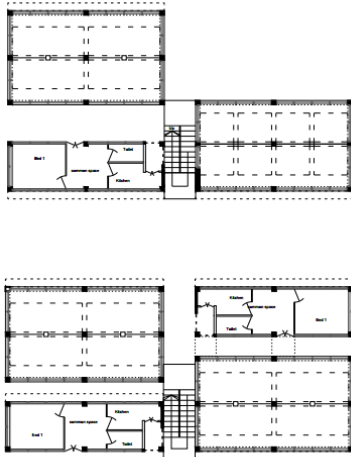


Figure 47-Wood workshop/Building Detail

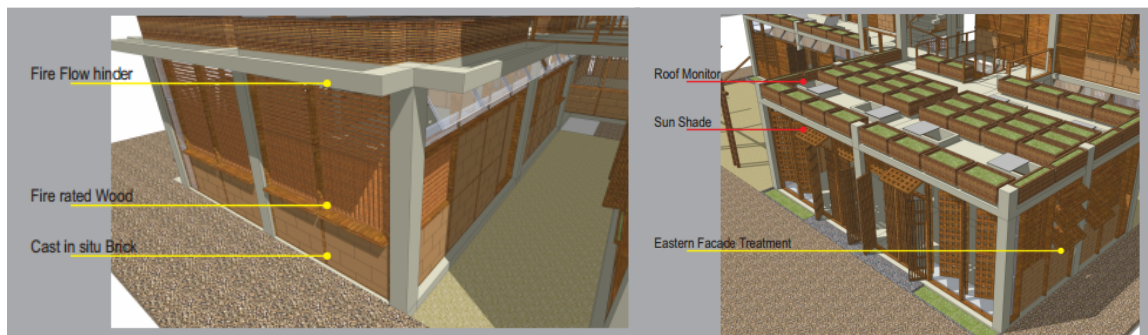


Figure 48-Elevation Treatment

Jute Workshop and Jute worker's House Detail

Jute Workshop

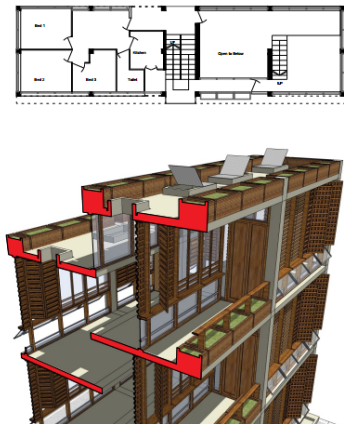


Figure 49- Jute workshop Detail

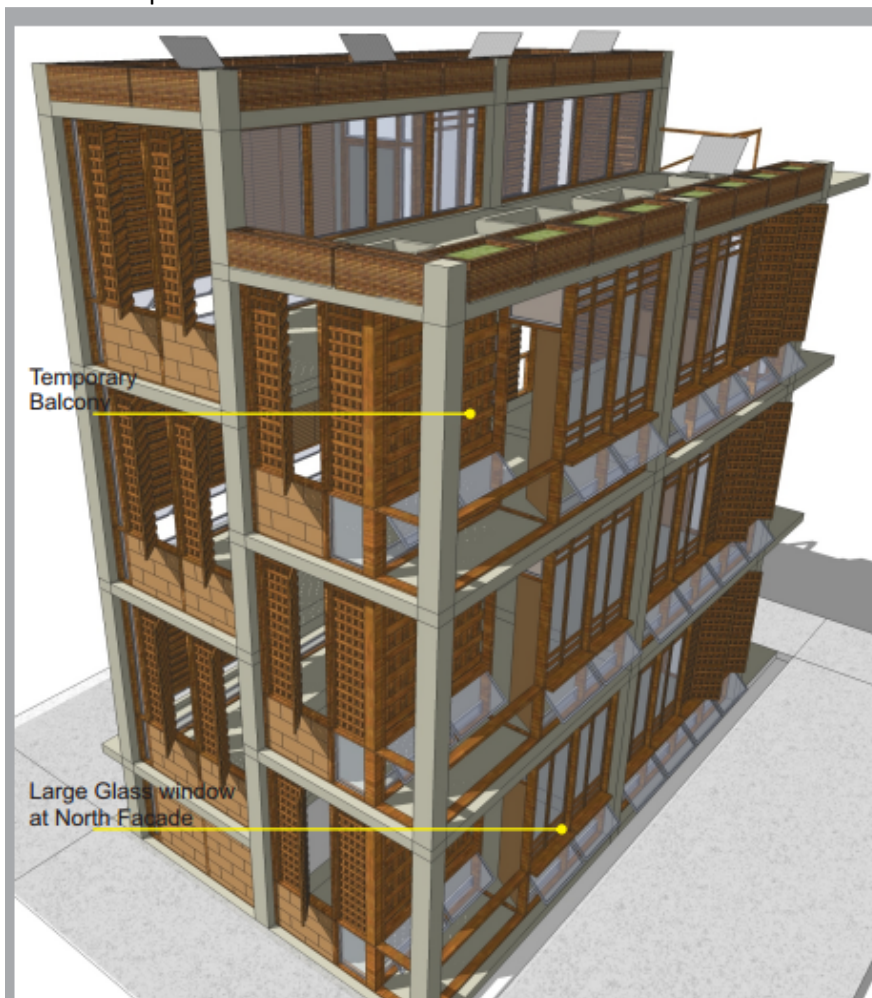


Figure 50-Building block

Dwelling Unit Detail

Dwelling Units

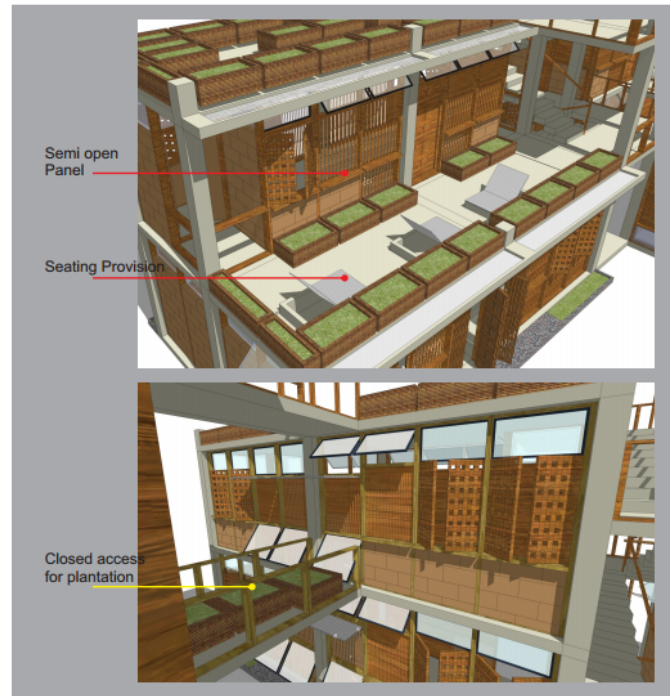
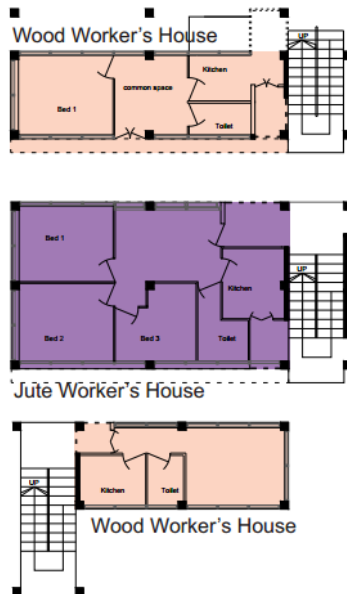


Figure 51-Building block treatment according to sun path



Figure 52-Terrace Garden detail

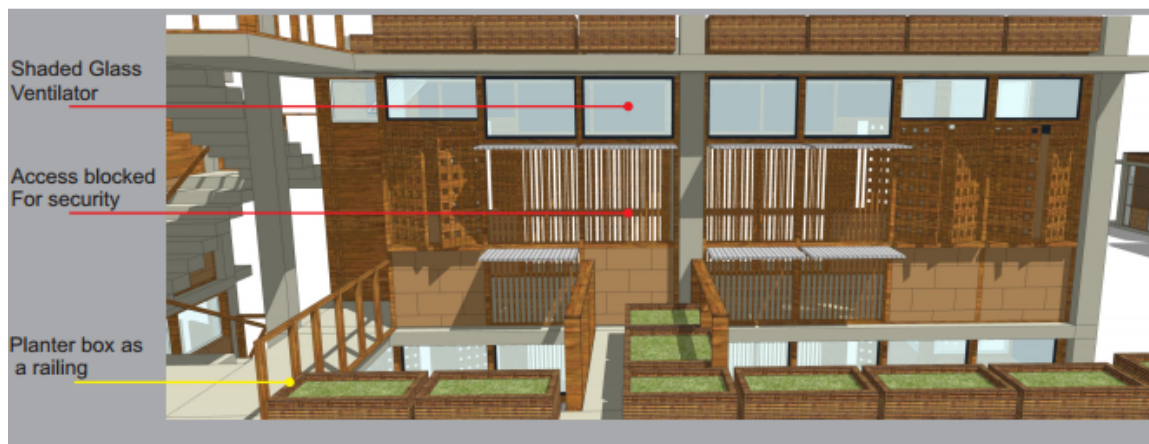
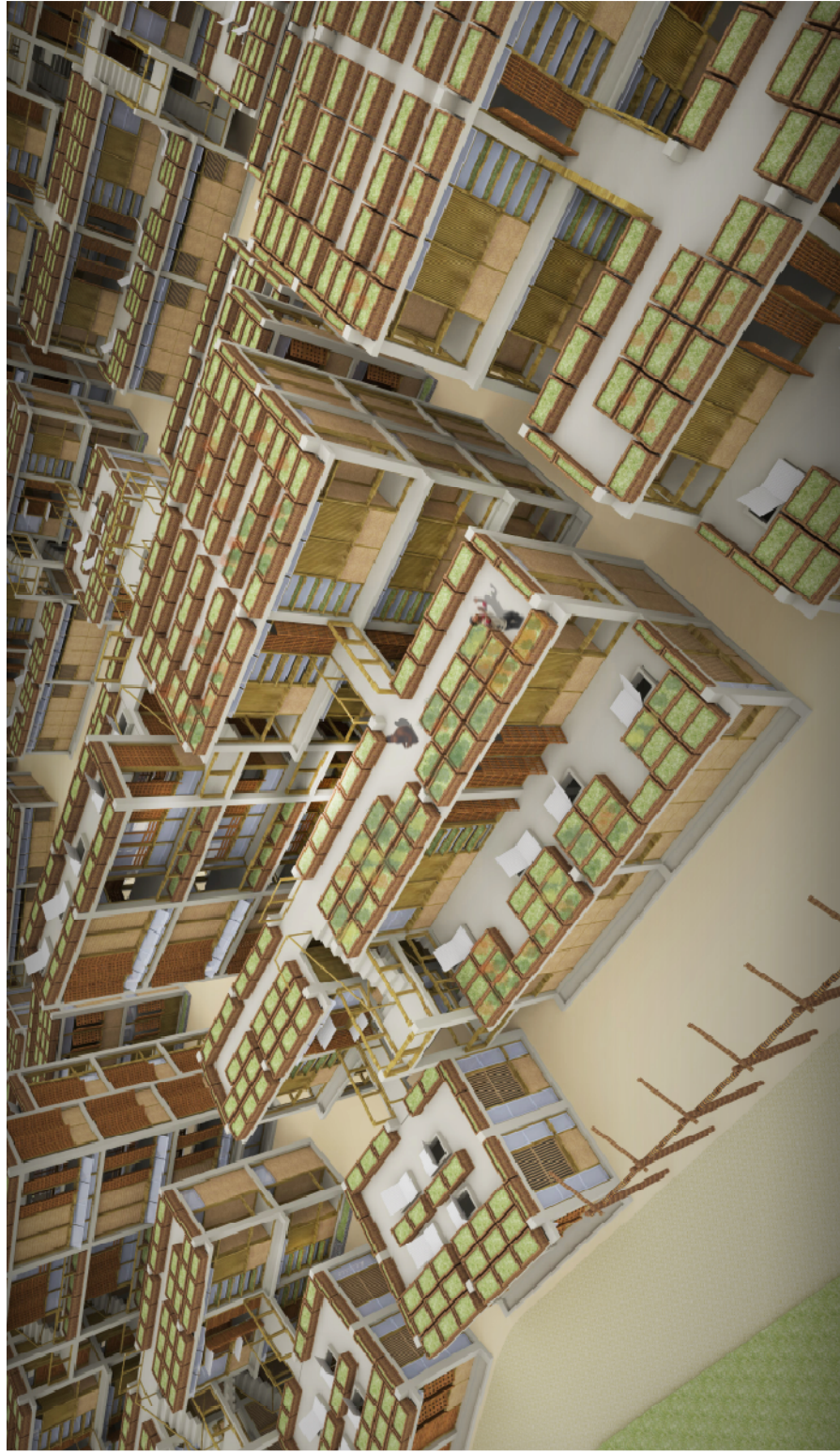


Figure 53: Accessibility and Security from the terrace to the dwelling unit

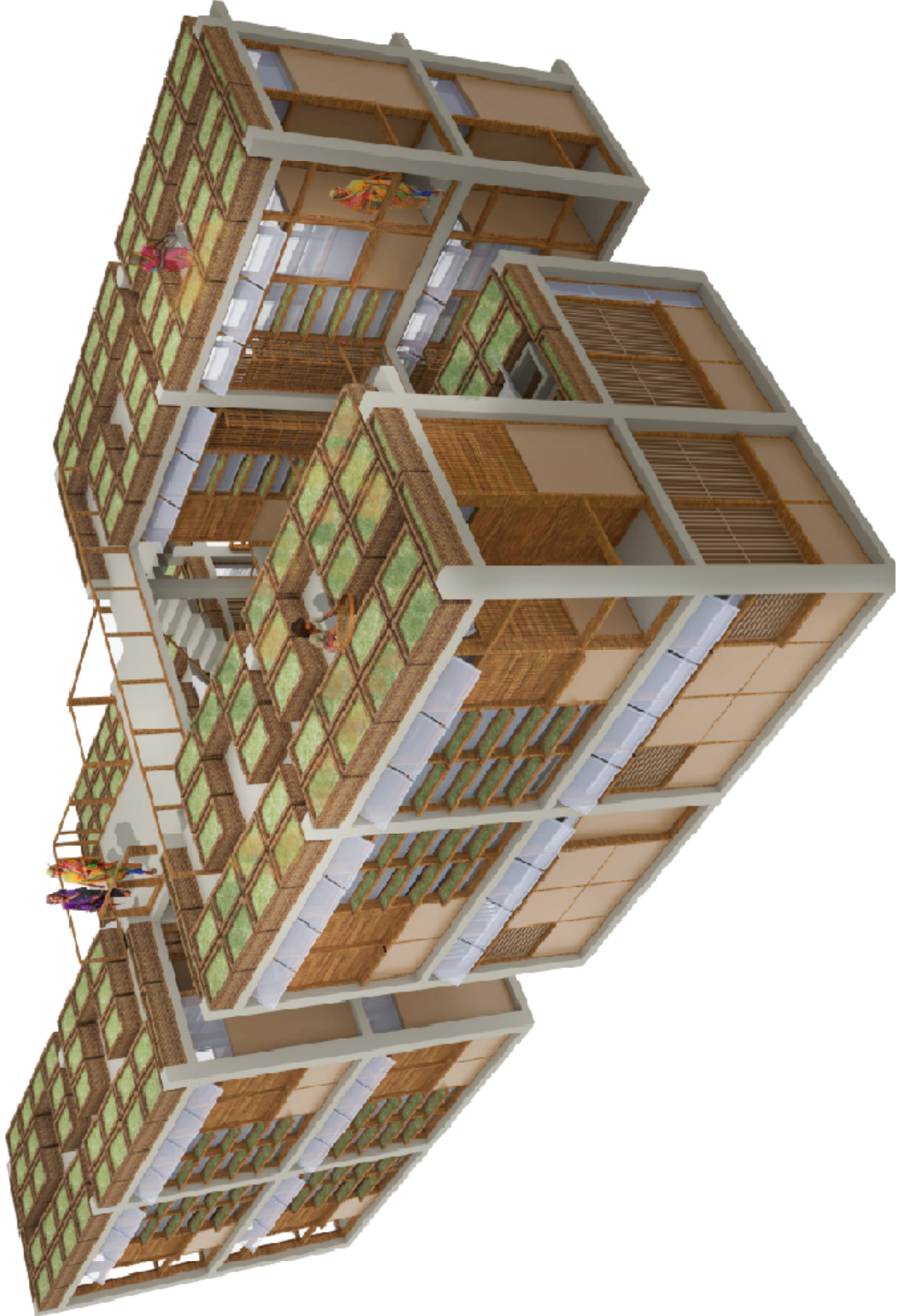
3d Visualization













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